Science 10 Physics Unit Review Questions:

1) Explain the difference between the uniform motion and the non-uniform motion.

Uniform motion describes the motion which moves in a stright line w/ a constant speed. Non-Uniform motion is the motion under acceleration.

2) What is the difference between a vector quantity and a scalar quantity?

Vector quantity has both direction and magnitude but a scalar quantity has only the magnitude.

3) What information can you obtain out of a position-time graph?

position of the object at artain times
velocity of the object
displacement of the object

4) If your initial position and final position are the same, what is your displacement?

It is zero.

5) If a position-time graph a slope of zero, what can you conclude about the velocity of the object?

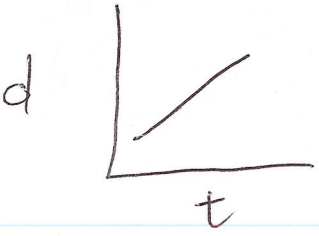
Velocity is not changing

6) What is a rate of change?

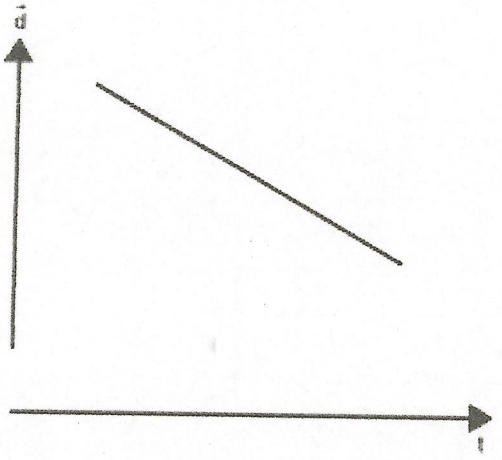
A measure of how quickly one quantity change, slope

7) When an object is moving in a constant positive velocity, how does its position-time graph look like?

a stright line up



8) Describe the motion of the following position-time graph.



~~velocity is decreasing~~
negative velocity

9) A boat took 250 seconds to travel 2300m. What was the boat's average velocity?

$$\vec{V}_{AV} = \frac{\Delta \vec{d}}{\Delta t} = \frac{2300\,m}{250\,s} = 9.2\,m/s$$

10) Convert 210m/s into km/h. Convert 78km/h into m/s.

$$210\,m/s \times 3.6 = 756\,km/h$$

$$78\,km/h \times \frac{1}{3.6} = 21.\bar{6}\,m/s$$

11) If you drive your car with an average velocity of 34m/s north, what would be your displacement if you drive for 1300s?

$$V_{AV} = \frac{\Delta d}{\Delta t} \Rightarrow \Delta d = V_{AV}\,\Delta t = (34\,m/s\,[N])(1300\,s)$$

$$\Delta d = 44200\,m\,[N]$$

12) An air plane flies with an average velocity of 780km/h south for 6.5 hours. What would be the plane's final position if its initial position is 1000km south?

$$\vec{V}_{AV} = \frac{\Delta \vec{d}}{\Delta t} = \frac{\vec{d}_f - \vec{d}_i}{\Delta t}$$

$d_i = 1000\,km\,[S]$
$= -1000\,km$
$\vec{V}_{AV} = 780\,km\,[S]$
$= -780\,km$
$\Delta t = 6.5\,h$

$\therefore \vec{V}_{AV}\,\Delta t = \vec{d}_f - \vec{d}_i$

$\vec{d}_f = \vec{V}_{AV}\,\Delta t + \vec{d}_i$

$$\vec{d}_f = (-780\,km/h)(6.5h) + (-1000\,km) = -6070\,km = 6070\,km\,[S]$$

13) A train's initial velocity is 50km/h East. If its velocity changes to 60km/h East, what is the change in velocity of the train?

$\vec{\Delta V} = \vec{V_f} - \vec{V_i} = 60\,km/h\,[E] - 50\,km/h\,[E] = 10\,km/h\,[E]$

14) A car moving west at 20m/s strikes a concrete wall and rebounds to the east at 2m/s. What is the car's change in velocity and the direction of the car's acceleration?

$\vec{\Delta V} = \vec{V_f} - \vec{V_i}$

$V_i = 20\,m/s\,[W] = -20\,m/s$

$V_f = 2\,m/s\,[E] = 2\,m/s$

$\Delta V = 2\,m/s - (-20\,m/s) = +22\,m/s = 22\,m/s\,[E]$

direction of acceleration is east.

15) Explain what happens to the velocity of the object, if it has an acceleration of $0m/s^2$.

velocity remains constant, it does not change.

16) A stationary skier starts to ski down the hill with an average acceleration of $3.4m/s^2$ for 15s. What is his final velocity?

$\vec{a} = \frac{\vec{\Delta V}}{\Delta t} = \frac{\vec{V_f} - \vec{V_i}}{\Delta t}$

$V_i = 0\,m/s, \quad V_f = ?$

$\vec{a} = -3.4\,m/s^2 \quad \Delta t = 15s$

$\vec{V_f} = \vec{a}\Delta t = (-3.4\,m/s^2)(15s) = -51\,m/s.$

17) How much time is required to accelerate from 35m/s [S] to 55m/s [N] with the acceleration of $8m/s^2$ [N]?

$\vec{a} = \frac{\vec{\Delta V}}{\Delta t} \Rightarrow \Delta t = \frac{\vec{\Delta V}}{\vec{a}} = \frac{\vec{V_f} - \vec{V_i}}{\vec{a}}$

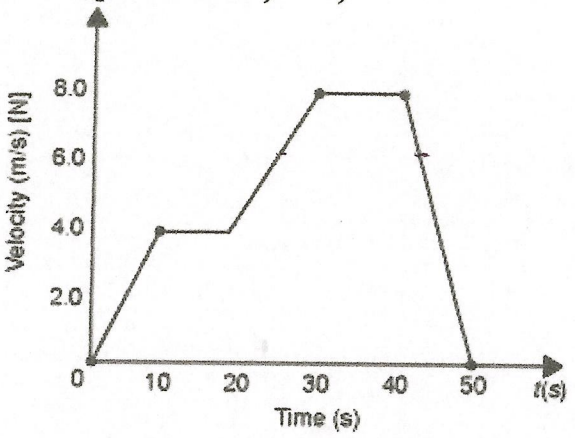
$\vec{a} = 8\,m/s^2\,[N] = 8\,m/s^2$

$V_i = 35\,m/s\,[S] = -35\,m/s$

$V_f = 55\,m/s\,[N] = 55\,m/s$

$\Delta t = \frac{55\,m/s - (-35\,m/s)}{8\,m/s^2} = 11.25s.$

18) The velocity-time graph below represents the motion of a truck. Read the graph and answer questions a) ~ e).



a) During which time interval was it moving the fastest?

$t = 30s \sim 40s.$

b) At what time(s) was its velocity 6m/s [N]?

25s and 45s.

c) During which time interval was it slowing down?

$t = 40s \sim 50s$

d) During which time interval was its acceleration zero?

$10s \sim 20s$
$t = 30s \sim 40s$

e) Calculate the average acceleration for the following time intervals.
0s~10s, 10s~20s, 20s~30s, 30s~40s, 40s~50s.

$0 \sim 10s$

$\vec{a} = \frac{4-0}{10-0}$

$\vec{a} = \frac{4}{10} = \frac{2}{5}\ m/s^2$

$\vec{a} = \frac{2}{5}\ m/s^2\ [N]$

$10 \sim 20s$

$\vec{a} = 0\ m/s$

$20s \sim 30s$

$\vec{a} = \frac{8-4}{30-20} = \frac{4}{10}$

$\vec{a} = \frac{2}{5}\ m/s^2$

$\vec{a} = \frac{2}{5}\ m/s^2\ [N]$

$30s - 40s$

$\vec{a} = 0\ m/s^2$

$40s \sim 50s$

$\vec{a} = \frac{0-8\ m/s}{50-40}$

$\vec{a} = -\frac{8}{10} = -\frac{4}{5}\ m/s^2$

$\vec{a} = \frac{4}{5}\ m/s^2\ [S]$

19) A skateboarder is moving with an velocity of 5m/s [E]. If his velocity doubles in a same direction in 5seconds, what is his acceleration?

$\vec{a} = \frac{\Delta \vec{V}}{\Delta t}$ $V_i = 5\,m/s$ $\Delta t = 5s$

$V_f = 10\,m/s$

$\vec{a} = \frac{10\,m/s - 5\,m/s}{5s} = 1\,m/s^2$

20) A rock is thrown up into the air with an initial velocity of 15m/s up. What is the rock's velocity after 0.4 seconds?

$V_i = 15\,m/s$ $V_f = ?$

$\Delta t = 0.4s.$, $\vec{a} = -9.8\,m/s^2$

$\vec{a} = \frac{\Delta V}{\Delta t} = \frac{\vec{V_f} - \vec{V_i}}{\Delta t}$

$\Delta t \vec{a} = V_f - V_i \Rightarrow V_f = \Delta t \vec{a} + V_i$

$V_f = (0.4s)(-9.8\,m/s^2) + 15\,m/s = 11.08\,m/s.$

21) You dropped a ball off the building. The ball's velocity when it reached the ground was 40m/s down. How long did it take to reach the ground?

$\vec{g} = \frac{V_f - V_i}{\Delta t} \Rightarrow \Delta t = \frac{V_f - V_i}{\vec{g}} =$

$\Delta t = \frac{-40\,m/s - 0\,m/s}{-9.8\,m/s^2} = 4.08s.$

22) Describe the difference between nuclear fusion and nuclear fission.

Nuclear fusion = 2 light-weight nuclei joining together to make energy

Nuclear fission = heavy nucleus splitting into 2 lighter nuclei to make energy.

23) How many protons and neutrons are in the nuclei of each of the following isotopes?

a) $^{40}_{19}K$ b) $^{231}_{91}Pa$ c) $^{131}_{53}I$ d) $^{60}_{28}Ni$

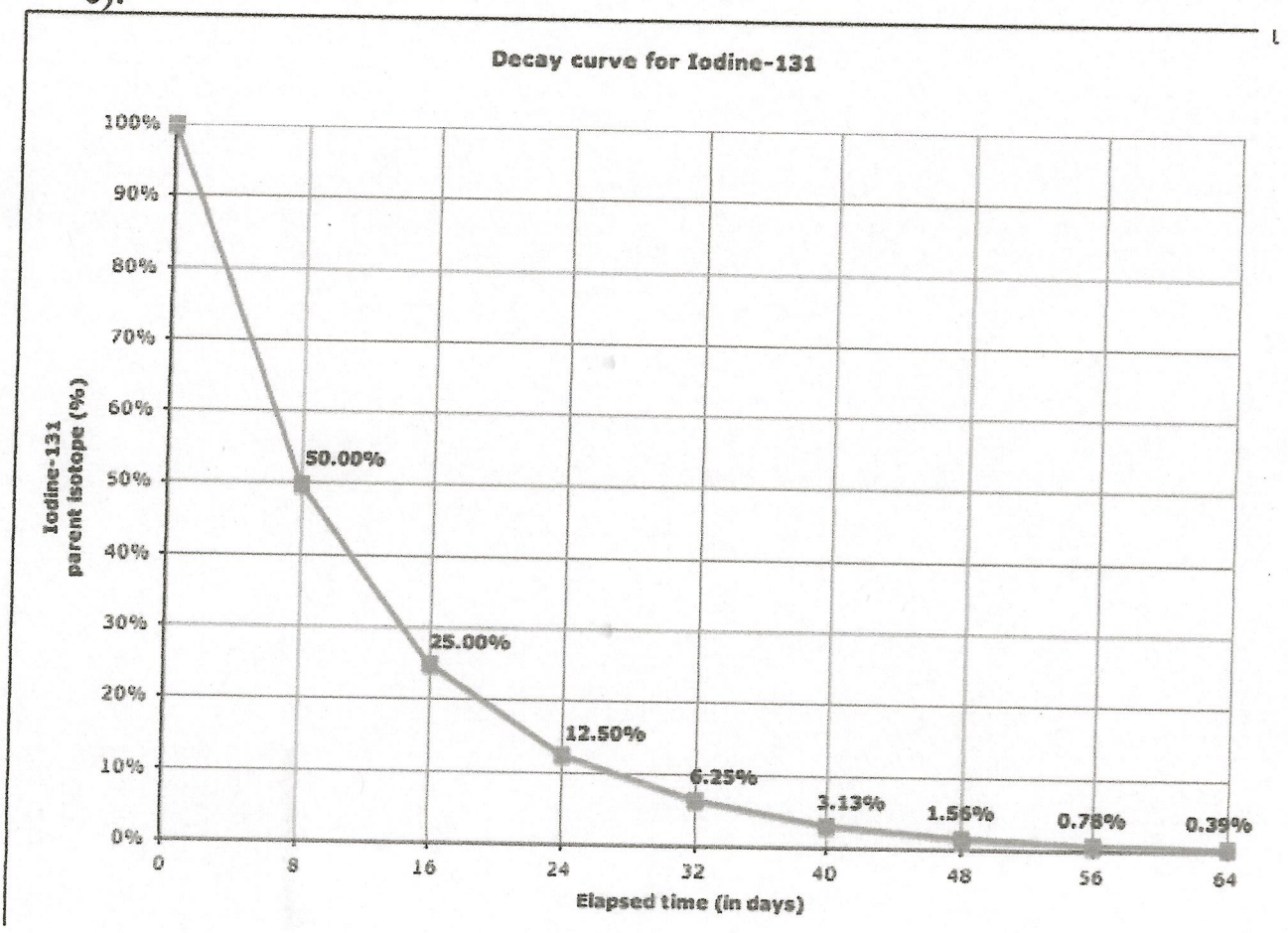
protons 19
neutrons 21

Protons 91
neutrons 140

Protons 53
neutrons 78

Protons 28
neutrons 32

24) Refer to the decay curve for Iodine-131 below and answer the questions a)~ e).



a) How long it the half life of Iodine-131?

8 days.

b) What percentage of Iodine-131 remains (i) after one half life? (ii) after two half lives? (iii) after three half-lives?

i) 50% ii) 25% iii) 12.50%.

c) Use the graph to estimate the percentage of Iodine-131 remaining after
(i) 12 days (ii) 35 days (iii) 50 days

37% 5% 1.4%

d) Estimate the time elapsed when the amount of Iodine-131 remaining is
(i) 80% (ii) 40% (iii) 20%

4 days 11 days 20 days

e) A sample of Iodine-131 weights 500g. What mass of iodine would remain after 24 days?

$500g \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = 62.5g$

25) What two isotopes are required to start the nuclear fusion reaction?

$^{2}_{1}H$ and $^{3}_{1}H$

26) Provide the nuclear symbol for each equation in the following list.

a) $^{201}_{80}Hg$ -----> $^{201}_{81}Tl$ + $^{0}_{-1}\beta$

b) $^{241}_{95}Am$ ------> $^{237}_{93}Np$ + $^{4}_{2}He$

c) $^{234}_{91}Pa$ --------> $^{234}_{92}U$ + $^{0}_{-1}\beta$ or $^{0}_{-1}e$

d) $^{222}_{86}Rn$ ---------> $^{218}_{84}Po$ + $^{4}_{2}He$ + $^{4}_{2}\alpha$

e) $^{238}_{92}U^{*}$ ---------> $^{238}_{92}U$ + $^{0}_{0}\gamma$